

marked-up version of the changes made to Claims 1 and 29 by the current amendment. The attached page is captioned "VERSION WITH MARKINGS TO SHOW CHANGES MADE". No new matter has been added by such amendments and the Examiner has stated she will reconsider Applicants' amended claims after final to further distinguish over Yamashita. (See, Interview Summary, Paper 7).

The Invention

The invention is directed to a solvent soluble poly(urethane/urea) resin derived by reacting polyurethane prepolymer at a controlled rate to the diamine of between about 1.5 weight percent per minute to about 5.0 weight percent per minute. The polyurethane prepolymer is the reaction product of (a) a diisocyanate component and a diol component which consist of (i) a first diol having a molecular weight below 2000 and (ii) a polymeric diol having a molecular weight below 3000; wherein the -NCO/-OH ratio is less than 2 and containing 1.3 to 6.0 wt. % of unreacted -NCO groups. The amount of diamine reacted with the prepolymer is 100% to 120% based on the equivalents of unreacted -NCO groups of the prepolymer.

The controlled rate of addition to the diamine of the polyurethane prepolymer was calculated based on the weight percent of the polyurethane prepolymer of between about 47-50 and the time in which it is added of between 10 to 30 minutes. The rate of weight percent over time is as follows:

$$47/10 = 4.7$$

$$48/10 = 4.8$$

$$49/10 = 4.9$$

$$50/10 = 5.0$$

$$47/30 = 1.56 \quad \text{Ex 1}$$

$$48/30 = 1.60 \quad \text{Ex 2}$$

$$49/30 = 1.63 \quad \text{Ex 3}$$

$$50/30 = 1.67$$

Rejection Under 35 U.S.C. § 102(b), or
in the alternative, Under 35 U.S.C. § 102(b)

Claims 1-6, 8-10, 13, 15, 20, 21, 24-30 and 36-41 have been rejected under 35 U.S.C., §102(b) as being anticipated by Yamashita (JP 4-209674), or in the alternative, under 35 U.S.C. §103 as obvious over Yamashita.

Although Yamashita discloses a polyurethane resin, Yamashita does not anticipate Applicants' solvent-soluble poly(urethane/urea)resin. Yamashita discloses merely adding a diol, a high-molecular-weight diol, an organic diisocyanate, a chain extending agent and a polymerization terminator. There is no order disclosed in adding the components together and in fact, Yamashita teaches that the components "are reacted all at once" (page 13, line 6) and even in each of Yamashita's examples (*i.e.* Application Examples 1 to 3, pages 18-21), the diamine is added to the urethane prepolymer solution. Further, the polyurethane resin of Yamashita includes a polymerization terminator. Thus, the polymerization in Yamashita is controlled by merely adding more of the terminator as needed so as to reduce gelling.

In contrast, Applicants' solvent-soluble poly(urethane/urea)resin is made by reacting a polyurethane prepolymer with diamine wherein the diamine is 100% to 120 % based on equivalents of unreacted -NCO groups and the polyurethane prepolymer is added at a controlled rate to the diamine. The order and rate of addition in Applicants' resin is critical if gelling of the poly(urethane/urea) resin is to be avoided. The surprising benefit of Applicants' solvent-soluble poly(urethane/urea) resin, as derived by Applicants' synthesis technique illustrates that controlling the rate of adding the polyurethane prepolymer solution to the diamine, where more than 100% diamine is used, eliminates or substantially restricts forming an extremely viscous and unworkable poly(urethane/urea) resin. (See, page 11, lines 7 and 8 of Applicants' specification). Accordingly, it is submitted that Yamashita's resin is completely different from Applicants' solvent-soluble poly(urethane/urea) resin. Yamashita's resin would unavoidably exhibit different physical properties than Applicants' solvent-soluble poly(urethane/urea)resin since the resin synthesis set forth in Yamashita would produce a gel or an extremely viscous resin.

Thus, Yamashita fails to disclose all of the features of Applicants' resin in that it does not disclose adding the polyurethane prepolymer to the diamine at a controlled rate where the diamine is between 100% to 120% based on equivalents of unreacted -NCO groups. Accordingly, Yamashita does not anticipate Applicants' invention.

Further, Yamashita teaches away from Applicants' solvent-soluble poly(urethane/urea) resin by adding polymerization terminators to control the gelling of the polyurethane resin. As discussed above, Yamashita's chemistry is completely different from that of Applicant's resin in that the polymerization is regulated by merely adding more or a polymerization terminator, and thus one of ordinary skill in the art would not look to Yamashita when determining the rate of addition of the diamine to the prepolymer, where the diamine is over 100% based on equivalents of unreacted -NCO groups. Accordingly, Yamashita does not teach or even suggest Applicants' resin and Applicants kindly ask that the rejection be withdrawn.

Rejection Under 35 U.S.C. Section 103

Claims 7, 11, 12, 14, 16-19, 22, 23, 31-35 and 42-49 are rejected under 35 U.S.C. §103(a) as being obvious over Yamashita in view of Peters (U.S. Patent No. 3,565,849).

The Examiner cites additional portions of Yamashita (Example 1, pages 7, 9, 11, 14, 15 and 31) to show that it would have been obvious to vary the composition of Yamashita's Application Example 1 by reversing Yamashita's addition of the diamine to the prepolymer when looking to the disclosure of Peters which discusses both orders -- the diamine to the prepolymer and the prepolymer to the diamine. However, the order of the addition in Peters is only relevant to the first step of chain reaction in Peters and thus one of ordinary skill in the art would not have combined the disclosure of Yamashita and Peters to arrive at Applicants' solvent-soluble poly(urethane/urea) resin.

As stated above, Applicants have discovered that adding the polyurethane prepolymer to the diamine at a controlled rate is critical to eliminate or to substantially avoid resin gelling. Nowhere in Yamashita is there a teaching that would lead one skilled in the art to deliberately add the urethane prepolymer (formed from a diisocyanate component) and a first and second diol component to the diamine. While Peters discloses both methods of either adding the prepolymer to the diamine or adding the diamine to the prepolymer, nowhere in Peters is the addition made at a controlled rate. Further, the chain extension process in Peters occurs in two steps wherein the second step requires adding the diamine to the dilute polymer solution. (See, col. 6, lines 57-59). Moreover, like Yamashita, Peters' polyurethane polymer solution includes a chain terminating compound. (See, col. 7, lines 11-14). Thus, Applicants' discovery that adding the prepolymer to the diamine at a controlled rate to eliminate or substantially avoid gelling is not taught or even suggested by either Yamashita and/or Peters.

Therefore, the teachings of Yamashita, even if combined with the teachings of Peters, would not render Applicants' solvent soluble poly(urethane/urea)resin obvious. Applicants kindly ask that the rejection be withdrawn.

Rejection Under 35 U.S.C. §102

Claims 1, 6, 8-10, 15, 20, 21, 24, 28-30 and 36-38 have been rejected under 35 U.S.C. §102(b) as being anticipated by Mauro et al. (U.S. Patent No. 6,245,695).

Although Mauro et al. discloses a polyurethane resin, Mauro does not anticipate Applicants' solvent-soluble poly(urethane/urea)resin. Mauro et al. discloses a diisocyanate compound, a polyester polyol, a chain extending agent and a polymerization inhibitor. There is no controlled rate of addition of the polyester polyol to the diisocyanate compound of between about 1.5 weight

percent of the polyester polyol per minute to about 5.0 weight percent of the polyester polyol per minute. Further, the polyurethane resin of Mauro et al. includes a polymerization inhibitor (See, col. 7, lines 29-30; col. 7, lines 60-62. Thus, the polymerization in Mauro et al. is controlled by merely adding more of the inhibitor as needed so as to reduce gelling.

The Examiner cites Example 1-2 of Col. 9 of the Mauro et al. in rejecting Applicants' claims. However, said example fails to disclose a polyurethane resin having a polyurethane prepolymer derived from reacting a diisocyanate component and a diol component made of a first diol of molecular weight below 2000 and a polymeric diol of molecular weight below 3000. The polyurethane prepolymer of Mauro et al. is formed by reacting a diisocyanate component and a polyester polyol component wherein the polyol is formed by reacting a polyol and a dicarboxylic acid (see Col. 5, lines 5 and 6). Accordingly, the polyols described and used in Mauro et al. would by definition contain three or more hydroxyl groups whereas Applicants' diol component must contain only two hydroxyl groups.

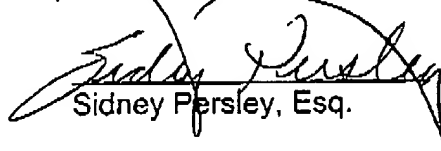
In addition, Mauro et al. does not disclose using diamine (the chain extender) greater than 100% based on equivalents of unreacted -NCO groups. Thus, Mauro et al. does not disclose all of the features of Applicants' solvent-soluble poly(urethane/urea) resin.

Accordingly, Applicants kindly ask that the rejection be withdrawn.

Conclusion

Applicants believe that the amendments and remarks provided herein adequately and completely address the rejections raised by the Examiner. It is respectfully submitted that all of the claims are now in condition-for-allowance.

Respectfully submitted,


Sidney Persley, Esq.

APPENDIX I

VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the Claims

1. A solvent soluble poly(urethane/urea) resin derived from a polyurethane prepolymer being the reaction product of:
 - (a) a diisocyanate component and a diol component having:
 - (i) a first diol having a molecular weight below 2000 and
 - (ii) a polymeric diol having a molecular weight below 3000; wherein the -NCO/-OH ratio is less than 2 and containing 1.3 to 6.0 % by weight of unreacted -NCO groups and
 - (b) diamine; wherein the amount of diamine is [80%] 100% to 120% based on the equivalents of unreacted -NCO groups and the polyurethane prepolymer is added to the diamine at a controlled rate of between about 1.5 weight percent per minute to about 5.0 weight percent per minute [to the diamine].

29. A solvent-based flexographic and gravure compatible laminating printing ink comprising:
 - (A) a solvent-soluble poly(urethane/urea) resin derived from a polyurethane prepolymer being the reaction product of:
 - (a) a diisocyanate component and a diol component having:
 - (i) a first diol having a molecular weight below 2000 and
 - (ii) a polymeric diol having a molecular weight below 3000; wherein the -NCO/-OH ratio is less than 2 and containing 1.3 to 6.0 % by weight of unreacted -NCO groups and
 - (b) diamine; wherein the amount of diamine is [80%] 100% to 120% based on the equivalents of unreacted -NCO groups and the

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polyurethane prepolymer is added to the diamine at a controlled rate of between about 1.5 weight percent per minute to about 5.0 weight percent per minute [to the diamine];

(B) a colorant; and

(C) an organic solvent.

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